

Establishing a Danish MSDI

This paper describes the establishment of a Danish MSDI. The establishment of a MSDI involving the maritime authorities will ensure that selected marine geographic data is readily available, can be brought together and shared between the maritime authorities for various purposes. In a longer perspective selected marine geographic data should also be shared between relevant countries and sectors. In addition, the MSDI should provide information about the data (metadata) such as when the data was last updated, how the data was collected, and how different organisations can get access to data, financial aspects and the quality of the selected data.

The Danish MSDI can be divided into four main components:

- A. Contractual framework (governances)
- B. Financial model
- C. Technical infrastructure
- D. Data to be included in the MSDI.

A. Contractual framework - Governance in regard to establishing a Danish MSDI

Details of the organisation and responsibilities for the respective parties are described below.

Organisation

A MSDI-forum for collaboration has been established, to ensure an efficient and coordinated development and use of maritime data.

MSDI-forum membership is based on those authorities that are a part of the collaboration for a Danish MSDI. These are: DMI, Danish Energy Agency, Defence Command Denmark, Danish Geodata Agency, Danish Agency for Culture, Danish Coastal Authority, Danish Environmental Protection Agency, Danish AgriFish Agency, Danish Nature Agency, Danish Police and Danish Maritime Authority. The Chairman for the MSDI-forum is at the Deputy Director level and will be undertaken by the Danish Geodata Agency. Other members of the forum are at the Head of Department level. Other institutions, e.g. within research, can, based on permission from the MSDI-forum, utilise the MSDI to exhibit relevant MSDI data, but are not a part of the MSDI collaboration, and therefore not represented in the MSDI-forum. However, they will have an affiliation via a relevant authority in the MSDI collaboration.

The MSDI-forum is administrated by a secretariat, established in the Danish Geodata Agency DGA.

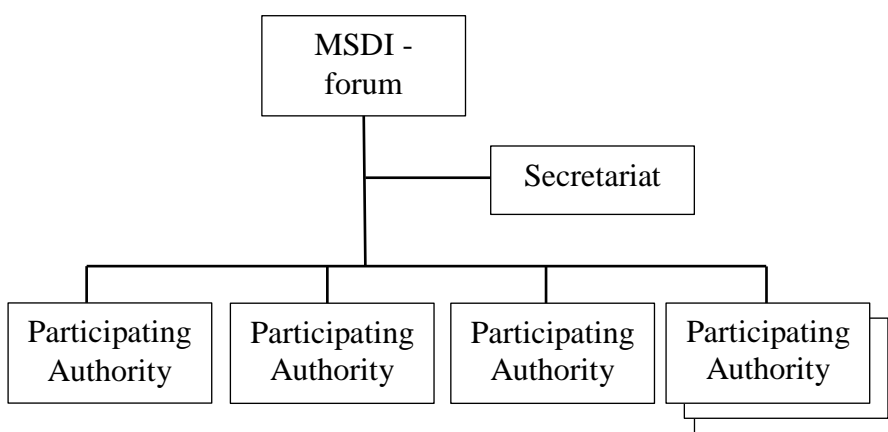


Figure 1. MSDI organisation

The MSDI-forum has amongst other tasks to:

- Approve cooperation agreements
- Approve the upcoming yearly budget
- Put forth new proposals to and initiate new developments for within the MSDI area, including to finance small analytical and developmental activities
- Hold meetings in the MSDI-forum based on demand, but at least once a year

The MSDI-forum gives a yearly orientation to the Maritime Forum of Director on the status and planned activities within the MSDI collaboration.

The MSDI-secretariat has amongst other tasks to:

- Ensure that standards, services, etc. fulfil the requirements that are described in the technical solution for the MSDI
- Ensure that updates for data and data quality are described and implemented as agreed upon
- Be primary point of contact for technical support for the users of the MSDI
- Propose new initiatives to further develop the MSDI area
- Responsible for the administrative part of the cooperation, hereby, produce cooperation agreements and conduct and prepare documents and draft decisions for meetings in the MSDI-forum
- Offer assistance and training of colleagues to the participating authorities

Obligations for participating authorities

The participating authorities that contribute their data commit to:

- Provide information on metadata and services as agreed upon within the technical description of the MSDI
- Identify a "single point of contact", which the MSDI secretariat can refer to in case of technical problems for an authority
- Participate in the MSDI-forum

Financing

Authorities that want services within the MSDI, pay an annual fee in accordance to the financial model as described below. This applies regardless if a participant provides data or not. Other institutions, such as universities, which, based on agreement with the MSDI-forum, contributes with relevant data to the MSDI, but do not use services from the MSDI, can do this outside of the financial agreement.

Agreements

A proposal is put forth that bilateral agreements are composed with DGA as an operator and the individual authorities. With bilateral agreements, the agreement structure becomes more flexible in relation to changes within participating authorities and also in relation to technical content, in case there may be future wishes for changes, e.g. functionality. Requests to secede from the MSDI-cooperation shall happen with a one year notification applicable from 1 April the following year.

Connection to INSPIRE

For a portion of the data that is a part of the MSDI, it is applicable that they are subject to the INSPIRE Directive. For INSPIRE data, it is amongst the requirements to establish metadata, data should be available in standardised form and there should be established services, so data can be shown and downloaded. This means that they should be ready to be included in the MSDI solution.

Priced data

For some dataset, which will be included in the MSDI, applies that they are priced, such as nautical chart data. It is the individual data owners that set the guidelines for use of their data including access criteria, payment models and international exchange.

B. Financial model

Key considerations for choice of financial model

In regard to establishing the financial model described below for the MSDI, there are several key considerations. Overall, the basis of the financial model should be transparent and flexible. It will thus be appropriate, that the financial model be sufficiently robust, so that a potential future expansion of the MSDI will not be complicated or delayed by consequent adjustments to the financial model.

Moreover, it seems fair for the financial model to ensure that the common costs, associated with establishment and drift of infrastructure, are evenly shared amongst the participating authorities. The majority of costs for establishment and drift of the MSDI are not dependent on the number of dataset, services and users and should be seen as a shared matter. Furthermore, it is important that the financial model ensures maximal dissemination and use of the MSDI. It would be undesirable for the financial model to create an incitement structure that inhibits growth in data exchange, which is one of the particular aims of establishing the MSDI. A financial model, where an individual institution's increase in use of the MSDI, leads to an increase in cost for this institution, seems to be ineffective.

Finally, the resources allocated to administration of the financial model, should reflect the relatively low establishment and drift costs associated with the MSDI. The low establishment and running costs should be reflected by a corresponding simple financial model.

Decision

Based on these considerations, the decision is therefore to use a simple financial model, where the costs are shared equally amongst the participants in the MSDI, and all the participating authorities thus have an equal responsibility for financing the establishment, drift and maintenance of the MSDI. The basis of the rationality is that all authorities make use of the common components in the MSDI, and all the components should be in place, regardless the number of users and datasets.

Costs related to establishment and drift of *options* are shared equally between those authorities, who wish to make use of the *options*.

The number of users from an authority will generally not influence the model to a very large extent. When the individual authority is established in the MSDI, multiple employees may use the MSDI, without impacting the financial relationship to the MSDI.

The chosen financial model will strengthen the use of data, as the model addresses the issue that the majority of the costs for establishment and drift do not have a direct relationship to the extent of the use of the MSDI. Additionally, the model will apparently be able to handle future expansions, due to the ease in adding new authorities, new datasets, services and users. Finally, the model is easy and simple to administer. Therefore, the model is a reflection of the MSDI as a shared infrastructure, where the extent of use of data does not incur any noteworthy additional costs.

Below, is an overall presentation of the combined financing of the MSDI based on a simple financing model. Here, the combined cost is demonstrated respective to establishment and drift of the MSDI and the corresponding expense per participating authority. A more detailed presentation of expenses related to establishment and drift of the MSDI is given last in this document.

The individual authority is responsible for preparing and quality assuring dataset and establishing and driving the necessary services including download services.

Setting up users/ administration of permissions in the MSDI is likewise carried out by the individual data owner. Priced data is settled separately between the data owners and the respective users.

Costs are paid on a yearly basis based on retroactive appraisal from 1 April to 1 April the following year. The MSDI Secretariat sends in advance of the MSDI-Forum meeting a draft for the forthcoming period's budget. The MSDI-Forum approves the budget for drift and maintenance.

Based on mutual agreement, the Geodata Agency can give assistance and advice about work related to the MSDI.

Special services outside of the MSDI agreement will be settled separately with DGA

To ensure an optimal financial model for the further drift, an evaluation of the financial model is recommended in 2017, after some experiences are obtained.

Allocation in relation to the recommended financial model:

- **Total establishment costs**
Establishment costs for 11 authorities
- **Total establishment costs for options**
Establishment costs for 11 authorities
- **Total drift costs**
Drift costs for 11 authorities

Expense catalogue - Expenses in relation to establishing the MSDI**2015:**

Item	Description	Amount
Metadata	Modification and consultation related to dataset and services through Geodatainfo. 100 hours.	
Communication platform	Set-up of shared site for visualising the various services. Set-up of link on the communication portal to the authorities own download services.	
Shared WEB visualisation system	Establish a shared platform for visualising geographical information and relevant documents. 100 hours. Set-up of platform with dataset. 100 hours.	
Licenses	Licenses for shared WEB visualisation system. License second half of 2015.	
Implementation	Services in relation to establishing the MSDI, including consultation and guidance, conducting workshops related to data, metadata and establishing services at the authorities, produce bilateral agreements and necessary documents for use for the MSDI-Forum. There is on average allocated 20 hours per authority for implementation. There is allocated 100 hours for support.	
Total MSDI 2015		

2016:

Item	Description	Amount
Metadata	Modification and consultation related to dataset and services through Geodatainfo. 100 hours.	
Shared WEB visualisation system	Set-up of platform with dataset. 100 hours.	
Licenses	Licenses for shared WEB visualisation system.	
Implementation	Services in relation to establishing the MSDI, including consultation and guidance, conducting workshops, produce bilateral agreements and necessary documents for use for the MSDI-Forum. There is on average allocated 20 hours per authority for implementation. There is allocated 100 hours for support.	
Total MSDI 2016		
Total establishment expenses 2015 + 2016		

Expenses in relation to running and maintenance of the MSDI:

For 2017 and thereafter

Item	Description	Amount
Secretariat's function, hereunder running, support and maintenance	Maintenance service and first line support. 200 hours.	

Training	Conduct courses and workshops for contact persons	
Shared WEB visualisation system	Shared visualisation portal – Blue Map of Denmark. 50 hours. + licenses.	
Secretariat's function, administration and economy	The administrative part of the cooperation, hereunder to maintain cooperation agreements, budgets, conduct and prepare documents and draft decisions for meetings in the MSDI-Forum. Propose new development initiatives within the MSDI area. Oversee that standards, services, etc. fulfill the requirements that are described in the technical solution for the MSDI. Overlook updates of data and that data quality is described and carried out as agreed. 100 hours.	
Total		

C. Description of the technical solution

Following items will be described:

- WEB-services
- Dataset and download
- MSDI (Communication platform)
- Shared visualisation platform
- Metadata for dataset and services
- Monitoring of INSPIRE services (option)
- Notifications related to new data (option)
- Service maintenance and support

WEB -Services

The individual authority makes their data available as WMS (Web Map Service) services in OGC standards that can be used in WebGIS (web based GIS) and desktop GIS.

The authority should choose to make their data available as WFS (Web Feature Service) services in a similar way as WMS services. By making WFS services available, attribute information about the data will be possible to see by the end users through GIS systems.

Services must as a minimum be provided in the geographic coordinate system WGS84 (EPSG: 4326), and UTM 32/33 Etrs 89. (EPSG:25832)

The services are provided by the individual authorities, so it is possible to access them via a query URL, which lists what a service offers. (Capabilities)

It must be possible to use the services in a shared WEB visualisation system, as an OGC based viewer for showing data in the MSDI and through the individual authorities' own systems, Desktop GIS clients, etc.

The services must perform sufficiently so the user does not experience noteworthy downtime during a query.

Real-time data is not shown.

User administration of data, not permissible for all to see, is performed by the individual authority. (For the shared visualisation system, the user administration is in the viewer)

There must be a 98% service uptime between 8.00 – 16.00 o'clock, other times at 98%.

Service windows and such must be notified three working days in advance.

Dataset and download

The individual authorities are generally responsible for preparing and quality assuring dataset, and for establishing and operating download services.

The dataset must be optimised for use, and delivered for download by the individual authorities in common formats such as SHAPE, TAB, DSFL, ASC, PDF, GeoPDF and GeoTIFF.

The dataset must, as a minimum, be possible to download in UTM32 Etrs 89 (EPSG:25832) coordinates and geographic coordinates (EPSG:4326).

It is important, that dataset available for download, are of good quality, follow common standards and are thematically cohesive.

Potential user administration is carried out by the authority/ data owner.

There must be a 98% uptime on download services between 8.00 – 16.00 o'clock, other times at 98%.

Service windows and such must be notified three working days in advance.

MSDI communication platform

A communication platform will be established based on the principles used in relation to 'Miljøportalen (Only in Danish)'

The individual services are shown as Capabilities URLs via the communications platform, as in the web service list from www.kortforsyningen.dk.

The communication platform will also describe which data the individual services deliver and link to metadata related to the data.

A MSDI communication platform can link to the individual authorities' download functions. Please refer to the section about dataset and download.

There must be a 98% uptime on the communication platform between 8.00 – 16.00 o'clock, other times at 98%.

Service windows and such must be notified three working days in advance.

Shared visualisation portal "The Danish Blue Chart"

GST develops and operates the shared visualisation portal for the MSDI data. The visualisation portal shows the services that the individual authorities provide, when published in WMS/WFS standards.

There is hereby established a shared platform for showing geographic information. The portal solution builds on pre-existing elements, which are available.

Data from the individual authorities' services are shown via the shared visualisation portal "The Danish Blue Chart".

For example, it is possible to see charts from DGA together with archaeological relics and ancient monuments from the Danish Agency for Culture, etc.

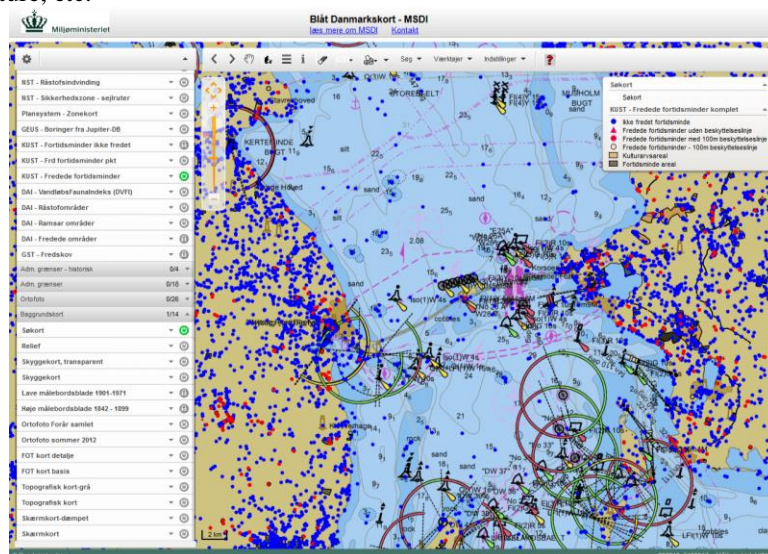


Figure 2. Shows an example from the MSDI "The Danish Blue Chart".

The MSDI is built with consideration for possible further developments in the future. This implies that, for example, it must be ensured that information linked to specific geographic data, such as rights conditions, restrictions, attributes or other information, related to individual objects, can be shared in the MSDI.

There must be a 98% uptime on the shared visualisation portal between 8.00 – 16.00 o'clock, other times at 98%.

Service windows and such must be notified three working days in advance.

Metadata for dataset and for services

Through metadata, it is possible for the user to obtain information about the different available dataset and services. The user can see information about data, but must actively retrieve the data themselves.

The INSPIRE Geoportal, which is the metadata portal for INSPIRE, is used in relation to the MSDI.

The responsible geodata authorities must establish and maintain their own metadata for data and services at Geodata-info.

Monitoring INSPIRE services (option)

GST offers monitoring of the MSDI's INSPIRE services and download. This means, that only one server is needed for the purpose, instead of each authority/ data owner needing to establish a server themselves, which altogether would result in less expenses.

Notification about new data (option)

The individual authorities notify GST when their data is updated.

GST offers to notify the users when there are new data in services and download, by means of tweets, e-mail or RSS-feeds, which they subscribe to from the communication platform.

Service maintenance and support

GST has responsibility for first line support and drift of the shared WEB visualisation system and the MSDI communication platform.

The individual authorities are responsible for answering questions about their own data (second line support) and will, by agreement, be obliged to answer to enquiries within 2 working days.

The MSDI secretariat has the overall responsibility for service, maintenance and training.

D. Data to be included in the MSDI.

Overview of dataset - Interests/ Planning items (numbering for planning activity):

Aquaculture (nr. 6) (mariculture incl. mollusc farming and algaculture facilities)

- Mariculture
- Aquaculture (molluscs)

Infrastructure at sea

- Infrastructure established on the territorial sea with the Danish Coastal Authority's permission hereby (algaculture structures, seaplane landing areas, cables, wrecks, buildings, boat harbour, mooring structures, etc.)
- Coastal protection structures
- (Coastal protection structures hereunder groynes, ripraps, slope protection, breakwaters, dykes, etc.)
- Beach nourishment areas
- Structures for exploitation of energy and production of renewable energy (nr. 1)
- Offshore windmills (facilities and production information) (marked on charts)
- Permits - feasibility studies, establishing and connection.

Fisheries (nr. 5)

- VMS data for fishing vessels over 12 m.
- Fishing weirs
- Fishing territory fishing weirs marked on charts (Executive order)

Outdoor recreation (nr. 11)

- Local laws and police laws can regulate conditions in an area

- Shared administrative data
- DTM
- DSM
- National boundaries (Exclusive economic zone and land boundaries)
- 12 and 24 nautical mile boundary and correct baselines
- KORT10

Harbours (nr. 12)

- Harbour locations (fishing harbour, commercial harbour, boat harbour within the same harbour area)
- Harbour boundaries on the territorial sea
- Depths in the harbour basin
- Development plans for the harbours, hereunder expected spatial needs
- Hydrographic conditions
- Depth data (depth archive)
- Depth contours (generated from the 5x5 meter grid database)
- Oceanographic observation data, fixed points (Water temperature, salinity)
- Prognosis data (current and waves, temperature, salinity, sea ice)
- Sea level measurement
- Current measurement
- Prognosis data, ecosystem (nutrients, oxygen)
- Oceanographic observation data (wave measurements)
- Ocean colour from satellite
- Ocean surface temperature from satellite
- Climate scenarios impacted in danish territorial waters
- Statistical/ climatic values from model-reanalysis (for ex. Max wave height, temperature, current)
- Marine cultural heritage
- Cultural heritage sites on the seafloor (shipwrecks, settlements, fishing weirs, "hold" etc.)

Maritime related (nr. 3)

- Ship traffic patterns; areas, territorial waters, tracks and passages that vessels actually use outside of recommended routes including bufferzones in relation to other activities
- Recommended tracks and marine traffic monitoring systems marked on charts etc.
- Permanent prohibited areas marked on charts (presence of ammunition and explosives)
- Other prohibited areas explosives excluding ammunition and explosives
- Warning/ not advisable areas marked on charts, presence of ammunition and explosives
- Temporarily restricted areas SFS foreslår denne slettet
- Anchorages marked on charts
- Pilot boarding place marked on charts
- Bridges over navigable water
- Leading lights (range lights), navigation marks etc. marked on charts
- Race course officially marked on charts
- Executive orders about restrictions against sailing, safety zones etc. In relation to energy structures, platforms etc.
- Military areas
- Shooting and explosives areas marked on charts

Nature protection (nr. 7)

- EU Bird protection area
- EU Habitat protection area
- EU Ramsar protection area
- Protected areas (including hunting and wild game management areas)
- Protected areas, proposals
- Nature Reserve (flora and fauna)

Emergency areas (nr. 10)

- Emergency areas

Underground areas (nr. 2)

- Offshore structures (platforms)
- Gas storage (permission for storing gas)
- CO2 storage (permission for storing CO2)
- Oil and gas extraction (cables, pipes, etc.)
- Exploration and extraction permits (oil/ gas)
- Drillings: Oil and gas extraction, geothermal, salt production, scientific
- Research and extraction permits (geothermal, salt production)
- Rundeudbudsområdet procurement area (oil/ gas))
- Open door procurement area (oil/ gas)
- Geothermal procurement area
- Procurement calls for possible exploitation of permits for injection of CO2 (to increase oil extraction) in existing oil fields in areas west of 6° 15' eastern meridian (polygon)

Mineral resource extraction (nr. 8)

- Mineral resource area at sea
- Mineral resource extraction - research permits
- Mineral resource extraction - common areas
- Mineral resource extraction - transitional areas (overgangsområder)
- Mineral resource extraction - Other permits §20
- Mineral resource extraction - Permits §20 auction
- Reservation of extraction areas

Other

- Police districts
- Femern Belt-connection
- Large potential infrastructure projects such as fixed connections.
- Wishes for additional dataset
- Geographic names (Danish Geodata Agency wish)
- Danger zones - more detailed than now (Danish Energy Agency's wish)
- 300 meter line from coast
- Seawater uptake (cooling water, etc.), and emissions (sewage, etc.)